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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
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Waver beverage containing fibers

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WATER BEVERAGE CONTAINING FIBERS

The present invention relates to a water-based beverage, which comprises soluble fibers without compromising shelf-stability, appearance, safety, taste as well as nutritional benefits.

Fibers have gain popularity among the past few years due to the large interest of both consumers and food companies for their acknowledged nutritional benefits.

Physiological features and nutritional benefits of fibers are broad. They are considered as having nutritional benefits on the control of glycemia, on the metabolism of cholesterol and triglycerides, on the gut fermentation through gas production, on the control of the function of the gastro-intestinal tract and are considered as having a prebiotic effect on gut microflora.

Dietary fibers are considered to be the soluble and insoluble components of food that are not digested by enzymes in the human gastro-intestinal tract. These fibers include non-starch polysaccharides, (from either vegetal, algae, bacterial or fugal origin) resistant starch as well as lignin and oligosaccharides.

Dietary fibers covers a wide variety of compounds that share the feature of being substantially non digested by gastro-intestinal enzymes in the gut where they are more or less fermented by the local micro-flora.

All dietary fibers have not the same structure nor the same physico-chemical properties and therefore provide different health benefits. Insoluble dietary fibers, such as cellulose and hemicellulose, are excellent for decreasing the tansit time of food through the digestive tract. On the other hand some soluble and very viscous fibers like guar gum and β-glucans have effect on glycemia and some non-viscous ones like fructo-oligosaccharides have positive impact on gut fermentation as well as on microflora development.

The primary source of dietary fibers is found in vegetables and cereal products. However nowadays, due to the increase of the consumption of processed-foods, the average daily intake of fibers is decreasing. Therefore there is a trend to complement processed foods with added fibers, whether soluble and/or insoluble. However, supplementation with fibers leads sometime to the problem of imparting a somehow gritty taste to the concerned food products.

Regarding beverages field, some attempts have been done to supplement beverages with fibers. Such beverage may comprise soluble or insoluble fibers and are often in the form of medicinal feeding beverage supplemented with sugar, dies as well as flavouring and aromas where fibers are suspended and/or dissolved in the liquid phase.

Regarding the supplementation of beverages with fibers, it is not really conceivable to use either viscous or insoluble fibers. Some attempts have been made in order to supplement beverages like soft drinks and clear beverages

with soluble fibers. US 5851578 describes a liquid beverage with soluble fiber added which is buffered with food acids. The beverage is pasteurized. Indeed, since fibers may be fermented by microorganisms like bacteria moulds and fungi, acidification is necessary to prevent fermentation and ensure good shelf-stability. This patent also teaches how to prepare a powder granular mix of the ingredients intended for the reconstitution of the said beverage.

However, if the acidification of the beverage can be considered as a good solution to minimize the risks of spoilage, some soluble fibers may undergo hydrolysis into simple sugar under such acidic conditions.

According to prior art the supplementation of fibers to beverage is better to be done just before consumption in order to avoid either spoilage or hydrolysis of soluble fibers.

US 6248390 discloses a water containing fiber. This patent describes the manufacture of such beverage by dissolving the fibers into water and also teaches that the resulting solution may be autoclaved in order to ensure microbial status. However, there are no trials presented in such document referring to autoclaving of such solutions. Indeed, it is suspected that such drastic heat treatment may involve partial hydrolysis of soluble fibers as well as an increase in the Optical Density of the solution. Moreover, currently most of the packaging materials suitable for bottled water are made of plastic such as PET and are not resistant to autoclaving where temperatures above 100°C are applied.

Therefore there remains a need for a clear beverage that contains soluble fibers which do not undergo hydrolysis, that is shelf-stable and that does not compromise taste, mouthfeel and appearance.

Accordingly, the present invention is directed to a shelf-stable, clear and neutral pH water composition comprising water and soluble fibers that is characterized by the fact that :

-the water is substantially demineralized

-and the soluble fibers comprise oligosaccharides with a chain length of about 2 to 20 units.

Surprisingly, it has been observed that the addition of fibers comprising oligosaccharides with a chain length of about 2 to 20 units, preferably 2 to 15 units and more preferable 2 to 8 units allows to obtain a clear water beverage without the drawbacks of the prior products. Chain length is also known as degree of polymerization, DP.

Suitable oligosaccharides may be chosen in the group comprising fructo-oligosaccharides made of fructose residues linked by β(2-1) bonds. The preferred fruto-oligosacchrides exhibit a chain length of around 2 to 20 fructose units, preferably 2 to 15 units and more preferably 2 to 8 fructose units.

The quantity of fibers contained in the water composition according to the present invention ranges from 0.1 to 10

gram of fiber per litre of water, preferably from 1 to 7 g/l and more preferably from 2 to 5 g/l.

The expression "neutral pH" means that the water composition according to the present invention has a pH ranging from about 5.5 to 8.5, preferably from about 6.5 to 7.5.

Also, the expression "substantially demineralized" means, in the present context, that the water composition according to the present invention has a mineral level of less than about 400 PPM, preferably less than 200 PPM, more preferably less than 100 PPM and even more preferably from about 40 to about 70 PPM.

In the present context, the expression "shelf-stable" means that the water composition according to the present invention can be stored whether at ambient, cold or high (around 37°C) temperature without microbial spoilage, degradation of the oligosaccharide, development of turbidity nor precipitation of the oligosaccharides, even for long time storage like months.

Under such neutral pH conditions no oligosaccharide chain hydrolysis occurs and all the nutritional benefits of these fibers are kept. The fibers that are contained in the present water composition can thus be delivered to the gut microflora without prior hydrolysis and can therefore provide their prebiotic effect.

Since the consumption of water is also appreciated chilled it is convenient to store the present water composition at

temperature of about 5°C. Interestingly, the water composition according to the present invention containing fibers may be store at such refrigeration temperatures and no precipitation of the dissolved fiber occurs. Such advantage is very interesting because such precipitation would be a definitive drawback regarding consumer acceptance.

Moreover, since the oligosaccharides do not undergo hydrolysis, they do not lead to the formation of simple sugars that could alter too much the neutral taste of the composition. However, it can be noticed that the addition of such fibers to water appears to be a convenient way to modify the bitterness, the sweetness, the softness, the astringency, the smoothness and metallic-ness of the water in a way that increases substantially its taste acceptability by consumers. Indeed, one drawback of low-mineral and demineralized waters is their taste, which is somehow perceived as bland and/or astringent. Thus, the addition of the selected fibers to low mineral water according to the present invention appears as a good means for providing a great tasting water that is smooth and not astringent and has only just a hint of sweetness.

Accordingly, the present invention also concerns a method for modifying the bitterness, the sweetness, the softness, the astringency, the smoothness as well as the metallic-ness of a neutral pH and substantially demineralized water by the incorporation of soluble fibers comprising oligosaccharides with a chain length of about 2 to 20 units.

Suitable oligosaccharides may be chosen in the group comprising fructo-oligosaccharides made of fructose residues linked by β(2-1) bonds. The preferred fructo-oligosacchrides exhibit a chain length of around 2 to 20 fructose units, preferably 2 to 15 units and more preferably 2 to 8 fructose units.

Regarding appearance of the water composition according to the present invention it is to be noticed that this water remains clear and translucent upon storage. Indeed, the specific choice of oligosaccharides with a chain length comprised between 2 and 20 units allows avoiding any precipitation during storage.

In spite of the fact that the present water composition is intended to be substantially demineralized for purpose of taste, it may also be supplemented with minerals since it has been suprisingly found that the somehow gritty and metallic taste of added minerals observed in mineral-enriched water may be masked by the use of the fibers according to the present invention. Suitable minerals may be selected from the group comprising Ca, Mg, Zn or Fe.

Mineral supplementation of the water composition according to the present invention may be achieved by addition of a metastable Calcium Lactate-Citrate or Calcium-Magnesium Lactate-Citrate complex as described in US 6,261,610 whose content is hereby incorporated by mean of reference.

According to consumer preference, the water composition according to the present invention may be supplemented with a whole range of functional ingredients that might

include vitamins, antioxidants, plants extracts and flavors such as camomile, tilleul, orange flower or guarurana for example.

Accordingly, the present invention also concerns the use of soluble fibers comprising oligosaccharides with a chain length of about 2 to 20 units for modifying the bitterness, the sweetness, the softness, the astringency, the smoothness as well as the metallic-ness of a neutral pH mineral-enriched water.

Due to the high stability of the fibers contained in the water composition according to the present invention, all the benefits of soluble fibers can be delivered to consumers in a simple, direct and convenient way, i.e. by simply opening a bottle of the water according to the present invention and drinking said water composition. Such bottled water is able to be stored at ambient temperature for a long time without adverse effects on the intrinsic properties and benefits that are delivered by the contained fibers.

Indeed, the present water composition, through delivering of fibers presents a means to deliver all the nutritional benefits of fibers, namely :

- improvement and increase of intestinal microflora (especially Bifidobacterium),
- short chain fatty acids production through fermentation of the fibers by the intestinal microflora,
- increase of faecal volume as well as faecal frequencies,

- moderation of post-prandial rise in blood glucose level for healthy human subjects (when the water consumption is associated with ingestion of a meal or a snack for example),

- prevention of intestinal mucosal atrophy in case of long-term enteral nutrition,

- favorable effects on serum cholesterol and triglycerides levels.

In order to manufacture the water composition according to the present invention without compromising the nutritional benefit of fibers and in order to ensure complete shelf-stability of the product, a soft manufacturing process may be achieved.

Such manufacturing process may comprise the following steps :

- providing a syrup comprising from 10 to 30% by weight of soluble fibers in water,

- filtering the said obtained syrup through a filter with a pore size sufficiently small to exclude at least 99.9% of the bacteria, fungi, molds and spores,

- providing a neutral pH and substantially demineralized water,

- filtering the said water through a filter with a pore size sufficiently small to exclude about 99.9 of the bacteria, fungi, molds and spores,

- treating the filtered water with Ozone in order to reduce the total microflora to about 0 cfu/ml (colony forming unit/ml) of water,

- mixing the filtered and ozonated water with the filtered syrup under aseptic condition in order to obtain the water composition according to the present invention,

- filling sterile bottles with the water composition in an ultra clean environment.

The filtration of both syrup and water may be achieved by means known by the skilled in the art, through membrane filter with pore size of around 0.2 to 0.5 µm, for example.

The ozonation of water may be achieved by bubbling ozone into the water in order to reach a level of about 0.1 to 1 PPM ozone.

A sterile filling may be achieved using plastic bottles and caps that are sterilized prior to filling whether by ozonation or thanks to H_2O_2, for example. The filling takes place in an ultra clean environment.

EXAMPLE 1

Manufacture of water composition with oligofructosaccharides.

A sterile syrup is prepared according to the following procedure :

A concentrated oligofructose syrup with an average degree of polymerization of 10 (10 fructose units) is dissolved in water in order to obtain two syrups containing 15 and 30% by weight of oligofructose. The thus obtained syrups are filtered through a membrane-filter equipped with 0.2 µm pores.

The sterilization of the syrups is checked by total aerobic microflora count and table 1 shows a complete elimination of viable microflora.

Water Samples	Before Filtration (cfu/ml)	After Filtration (cfu/ml)
30% oligofructose - DP 10	164	0
15% oligofructose - DP 10	17	0

TABLE 1- Microbial counts of filtrated oligofructose syrup.

Sterile water is prepared according to the following procedure :

Water with a mineral content of 75 PPM and a pH of 6.5 is filtered through a 0.2 µm pores membrane filter.
The filtered water is then ozonated by bubbling ozone gas into it in order to dissolve 0.8-1.0 PPM ozone in the water and obtain a final ozone content in finished product of a minimum of 0.2 PPM immediately following filling.

Then, both sterile mixtures (syrup and water) are mixed in line under sterile condition and filled in an ultra clean environment (minimum class 100 conditions) or aseptically to obtain a final concentration of fibers (oligosacchraides) of 4 g/l.

The bottles may be stored for several weeks even months without microbial development, without off-taste apparition, no oligossaccharide hydrolysis nor appearance of any coloration. Alternatively, the bottled water containing fibers may also be store at refrigeration

temperature and no precipitation of the dissolved fiber occurs.

EXAMPLE 2

Organoleptic assessment of the water containing fiber.

A panel of 22 consumers in the age group of 25-60 was asked to rate the taste, smell and appearance of the following water compositions :

Water composition according to example 1 stored at different temperature versus low mineral spring water. The results of the test are showed in Table 2.
It is clear that the water composition according to the present invention is highly preferred compared to classical spring water.

It can be noticed that for both cases, the differences between the samples are clearly perceived and the organoleptic descriptors used for differentiating the products are very positive. The water composition according to the present invention has an improved taste being smoother and not perceived as astringent compared to the spring water.

TABLE 2 : Consumer acceptance and organoleptic features of the composition according to the invention.

Group 1	water sample of example 1 kept at room temperature	milky, a little bit sweet, fruity, taste perceived, little flavor of cameral, , mouthfeel is round & soft, yoghurt taste	21 of 22 person can feel the difference	the two products are different at 0.1% level
	low mineral spring water	sweet, neutral, bitter, a little bit sour, astringent, metallic, aftertaste is bitter		
Group 2	water sample of example 1 kept in 37°C	sweet, milky, fruity, cameral, aroma is like candy , sweet , chlorine, yoghurt taste, maybe not fresh	17 of 22 person cab feel the difference	the two products are different at 5% level
	low mineral spring water	bitter, neutral, fermented, slight moudly flavor, normal,		

Subsequently larger scale trials were conducted with more than 200 consumers and the product was preferred 65:35 against a low mineralized water.

CLAIMS

1. Shelf-stable, clear and neutral pH water composition comprising water and soluble fibers that is characterized by the fact that :

- the water is substantially demineralized
- and the soluble fibers comprise oligosaccharides with a chain length of about 2 to 20 units.

2. Water composition according to claim 1, characterized in that oligosaccharides are chosen in the group comprising fructo-oligosaccharides made of fructose residues linked by β(2-1) bonds.

3. Water composition according to claim 1, characterized in that the fibers quantity contained in the water composition ranges from 0.1 to 10 grams of fibers per litre of water.

4. Method for modifying the bitterness, the sweetness, the softness, the astringency, the smoothness as well as the metallic-ness of a neutral pH and substantially demineralized water by the incorporation of soluble fibers comprising oligosaccharides with a chain length of about 2 to 20 units.

5. Use of soluble fibers comprising oligosaccharides with a chain length of about 2 to 20 units for modifying the bitterness, the sweetness, the softness, the astringency, the smoothness as well as the metallic-ness of a neutral pH mineral-enriched water.

ABSTRACT

Water beverage containing fibers

The present invention relates to a water-based beverage containing soluble fibers. The water composition is substantially demineralized and has a neutral pH. The soluble fibers contained in the present water composition are selected from a group comprising oligosaccharides with a chain length of from about 2 to 20 units. The present water composition may be store without adverse effect such as hydrolysis of oligosaccharides nor precipitation of the soluble fibers contained in it.

PCT Application

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